PHOTOMETRIC PROPERTIES OF ICY BODIES: A COMPARISON

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Photometry is the quantitative measurement of reflected or emitted radiation. In the past 15 years, the classical study on radiative transfer by Chandrasekhar (1960) has been extended to planetary surfaces of arbitrary albedo, including bright icy satellites (e.g., Hapke, 1981 JGR, 1984 and 1986, **Icarus).** By fitting these models to a wide spectrum of celestial bodies, we have been able to understand the surface properties of icy bodies in the Solar System (e.g., Buratti, 1991 JGR; Domingue et al., 1991, Icarus). The properties derive include the single scattering albedo, the macroscopic roughness of the surface, the compaction state of the optically active portion of the regolith, and the directional scattering properties of the individual icy particles. This latter quantity depends on the size and shape of the particles, as well as their composition and the nature of any impurities in the ice. The Table below offers some examples of these parameters: the single scattering albedo (w), the RMS slope angle (to describe macroscopic roughness) , the asymmetry factor g, to describe the directional scattering properties of scattered radiation (g=-1 describes perfectly backscattering radiation, while g=l describes forward scattering) , and the percent of void space (Buratti, ibid.; Veverka, 1973 **Icarus).**

Object (Leading side)	w	slope angle (degrees)	**9**	void space (%)
Europa	0.92	10	**-0.43**	**96**
Ganymede	0.82	29	**-0.20**	**80**
Callisto	0.43	36	-0.23	92
Enceladus	0.99		-0.35	90
Earth	0.99		-0.5	

The most striking difference between terrestrial and celestial ice is that the latter is strongly backscattering. One theory advanced for this observation is that extraterrestrial ice and snow are much more complex in structure than their terrestrial counterparts (Verbiscer et al., 1990 **Nature) .** Another possibility is that the directional scattering properties are not all that different. In this interpretation, the finding of a high degree of backscattering of satellite surfaces is an artifact of the fitting process and the lack of observations at large scattering angles.

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